10CFR50.73

Virginia Electric and Power Company
Surry Power Station
5570 Hog Island Road
Surry, Virginia 23883

December 2, 2016

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555-0001

Serial No.: 16-419
SPS: TSC
Docket No.: 50-281
License No.: DPR-37

Dear Sir or Madam,

Pursuant to 10CFR50.73, Virginia Electric and Power Company hereby submits the following Licensee Event Report applicable to Surry Power Station Unit 2.

Report No. 50-281/2016-001-00

This report has been reviewed by the Station Facility Safety Review Committee and will be forwarded to the Management Safety Review Committee for its review.

Very truly yours,

NRL

N. L. Lane
Site Vice President
Surry Power Station

Enclosure

Commitment contained in this letter: None

cc: U.S. Nuclear Regulatory Commission, Region II
Marquis One Tower, Suite 1200
245 Peachtree Center Ave., NE
Atlanta, GA 30303-1257

NRC Senior Resident Inspector
Surry Power Station

IE22
NRR

NRC FORM 366 (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Surry Power Station, Unit 2	05000 - 281	1 OF 3

4. TITLE

Unit 2 Reactor Trip due to Generator Differential Lockout

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	09	2016	2016	- 001 -	00	12	08	2016	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
N	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
100	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify In Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Barry Garber	(757) 365-2725

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	EA	IPBU	C712	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On October 9, 2016 at 0254 hours, with Unit 1 and Unit 2 at 100 percent power, Unit 2 experienced an automatic reactor trip initiated by a turbine trip due to generator differential lockout relay actuation. At the time of the trip, high wind and heavy rain conditions existed due to the effects of Hurricane Matthew. All three auxiliary feedwater pumps automatically started on low-low steam generator water level as expected. All plant systems functioned as required, and Unit 2 was stabilized at hot shutdown. The trip response was not affected by any previously inoperable systems, structures, or components.

The direct cause of the generator differential lockout was an electrical ground overcurrent initiated by water accumulation in the "A" phase of the "A" station service transformer leads termination enclosure. Affected electrical enclosures were drained, the system was tested, and modifications to the enclosures to prevent recurrence of water intrusion were completed prior to returning Unit 2 to power operation on October 13, 2016.

This report is being submitted pursuant to 10CFR50.73(a)(2)(iv)(A) as an event that resulted in the automatic actuation of the Reactor Protection System and the Auxiliary Feedwater System.

NRC FORM 366A (11-2015) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018

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LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Surry Power Station, Unit 2	05000 - 281	2016	001	00

NARRATIVE

1.0 DESCRIPTION OF THE EVENT

On October 9, 2016 at 0254 hours, with Unit 1 and Unit 2 at 100 percent power, Unit 2 experienced an automatic reactor trip initiated by a turbine trip due to generator differential lockout relay actuation. At the time of the trip, high wind and heavy rain conditions existed due to the effects of Hurricane Matthew. All three auxiliary feedwater (AFW) pumps [EIIS-BA-P] automatically started on low-low steam generator (SG) [EIIS-AB-SG] water level providing flow to the SGs as expected. Operation of the main steam power operated relief valves (PORVs) [EIIS-SB-RV] and the main steam dump valves [EIIS-SB-TCV], coincident with the initiation of AFW, resulted in the Unit 2 reactor coolant system (RCS) temporarily cooling to 542 degrees F. RCS temperature was restored to nominal average temperature of 547 degrees F at 0320 hours. Main feedwater flow was re-established to control SG level, and AFW was secured at 0336 hours.

At 0609 hours, a four-hour report to the NRC was made pursuant to 10CFR50.72(b)(2)(iv)(B) due to valid automatic actuation of Reactor Protection Systems and an eight-hour report was made pursuant to 10CFR50.72(b)(3)(iv)(A) due to automatic actuation of the AFW system.

2.0 SIGNIFICANT SAFETY CONSEQUENCES AND IMPLICATIONS

This event resulted in no safety consequences or implications. There were no testing or surveillance procedures in progress when the reactor trip occurred. Appropriate operator actions were taken in accordance with station procedures, and the unit was brought to a stable condition. Station equipment relied upon to mitigate the event responded as designed. Normal offsite and emergency power supplies were available during the event. The health and safety of the public were not affected.

3.0 CAUSE

The 22 KV electric output of the main generator is sent to the Main Transformers and the Station Service Transformers (SST) [EIIS-EA-XFMR] through the Isolated Phase Bus Duct (IPBD) [EIIS-EA-IPBU] System. The current Unit 2 IPBD system and SST leads termination enclosures were installed by design changes in 2011 and 2015, respectively. As part of the October 2016 post-trip inspection, water was found in two leads termination enclosures and in some IPBD horizontal runs. Water appears to have entered the system during ongoing heavy rain and wind conditions through gaps at mechanical joints associated with the SST leads termination enclosure and the IPBD.

The direct cause of the reactor trip was a ground of the 'A' phase on the high side (22 KV) of the 'A' SST due to water accumulation in the 'A' SST leads box, resulting in the actuation of the generator differential lockout relay. Without a drain path, the water level in the enclosure increased up the insulator creating a path to ground.

The root cause for the water intrusion and the resulting trip was the lack of testing and inspection of mechanical joints to ensure a weather tight system was accomplished after modifications. The design change specifications included provisions to ensure weather tightness, including detailed instructions for testing of welds and an array of electrical tests. However, no guidance was provided for inspection or

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testing of mechanical connections for the bus duct insulator hardware and gaskets, or for the termination enclosures.

4.0 IMMEDIATE CORRECTIVE ACTIONS

Following the reactor trip, control room operators acted promptly to stabilize the unit in a safe, hot shutdown condition in accordance with station procedures.

5.0 ADDITIONAL CORRECTIVE ACTIONS

A root cause evaluation (RCE) team was assembled to determine the cause of this event and to recommend corrective actions. While Unit 2 was shut down, water was removed from the IPBD and leads termination enclosures, and breaches that allowed water intrusion were sealed. Additionally, the 'A' phase SST and IPBD systems were dried using forced dehumidified air. Weep holes were installed at low points in the SST leads termination enclosures and Generator Step-Up transformer (GSU) [EIIS-EL-XFMR] leads termination enclosures to allow drainage of potential moisture intrusion. All three phases of the IPBD system were meggered to verify no further grounds existed.

6.0 ACTIONS TO PREVENT RECURRENCE

Weep holes installed in the transformer termination enclosures as described in section 5.0 above will prevent the possibility of creating a ground path by water accumulation. Design change testing procedures will be revised to include more rigorous instructions for non-safety design changes and common tests for electrical enclosures. Engineering qualification requirements will be updated to ensure that engineers are trained on lessons learned from this event. Additionally, upcoming design changes associated with Reserve Station Service Transformers (RSST) [EIIS-EA-XFMR] will be reviewed and revised as needed to capture lessons learned from this event.

7.0 SIMILAR EVENTS

None

8.0 MANUFACTURER/MODEL NUMBER

AZZ – Calvert Isolated Phase Bus / 7085

9.0 ADDITIONAL INFORMATION

Unit 1 was at 100 percent power at the time of this event and was unaffected by the Unit 2 reactor trip. Unit 1 entered a refueling outage on October 23, 2016. The corresponding Unit 1 IPBD and SST leads termination enclosures were inspected for the accumulation of water. Water was identified on the low side (4 KV) of the 'B' SST leads termination enclosure on Unit 1. As in Unit 2, weep holes were installed on the Unit 1 SST and GSU leads termination enclosures, and connections were inspected and sealed as necessary. Other transformer terminations (including those associated with emergency power supplies) are not enclosed by bus ducts, and therefore are not affected by this event.